REMARKS

An excess claim fee payment letter is submitted herewith for nine additional total claims and six additional independent claims.

Claims 1, and 4-50 are all the claims presently pending in the application. Claims 1, 4, 13, 18, and 25 have been amended to more clearly define the invention, claims 2-3 have been canceled and claims 42-50 have been added. Claims 1, 4, 13, 40, and 45-50 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicant also notes that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Applicant gratefully acknowledges that claims 40 and 41 allowed. However, Applicant respectfully submits that all of the claims are allowable.

Applicant gratefully acknowledges that claims 5-7, 9-12, 15-19, 25-29, and 36-39 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, Applicant respectfully submits that all of the claims are allowable.

Claims 1-4, 8, 13-14, 20-21, 30-31, and 34-35 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the D'Amico, et al. '100 reference (USPN 5,157,100), in view of the D'Amico, et al. '593 reference (USPN 5,159,593), and further in view of the Gitlits reference (USPN 5,859,841). Claims 22-24, and 32-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the D'Amico, et al. '100 reference, in view of the D'Amico, et al. '593 reference, and further in view of the Gitlits reference and even further in view of and the

Janesch, et al. reference (USPN 6,072,842).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

A first exemplary embodiment of the claimed invention, as defined by independent claim 1, is directed to an automobile communications method for an on-board mobile station across a plurality of radio zones which are consecutively arranged along a road. The method includes providing each of the radio zones with a plurality of communication frequencies, switching between said plurality of communication frequencies within each of the radio zones using a time division scheme such that a different time slot is allocated for adjacent radio zones for each of the plurality of communication frequencies. The communication between the plurality of radio zones and the on-board mobile station is made using a single frequency within a single radio zone, and switching a time slot allocated to the on-board mobile station to continuously communicate with the on-board mobile station across the plurality of radio zones.

As explained by the present specification, conventional communication systems use a Time Division Multiple Access (TDMA) communication protocol in which different time slots are used at the same frequency. These TDMA systems enable a wide frequency range to be used. However, it is necessary to increase transmission power by an amount which corresponds to the increase in noise to obtain a desired carrier to noise ratio. Additionally, various distortions deteriorate performance. Further, wide-band devices are needed.

By contrast, the present invention provides a novel system having advantages of both Frequency Division Multiple Access (FDMA) and TDMA systems by arranging a plurality of frequencies in each radio zone and switching these frequencies in a time division mode

within each radio zone and also by switching time slots for each frequency between adjoining radio zones so that individual mobile stations do not have to switch frequencies within a single radio zone.

Rather, each mobile station can communicate continuously using the same frequency within a single radio zone across the plurality of radio zones merely by switching the time slot. In other words, continuous communication is allowed at the same frequency for a mobile station within a single radio zone and the frequency range of each of a plurality of frequencies is substantially equivalent to that of an existing FDMA system.

Additionally, the present invention has a further advantage in that interference between adjoining zones can be avoided. Each zone communicates using a plurality of frequencies and switches between these plurality of frequencies in time division manner which is coordinated with adjoining radio zones so that adjoining radio zones do not communicate simultaneously using the same frequency.

In this case, as long as the same frequency is not selected at the same time between adjoining zones, then time slot positions used in adjoining zones are arbitrarily selected. In other words, it is not necessary to select different time slots between adjoining zones. On the other hand, when a communication frequency is switched, if the same frequency can be selected at the same time between adjoining zones, then different time slots are allocated between adjoining zones.

II. THE PRIOR ART REJECTIONS

A. The D'Amico et al. '100 reference in view of the D'Amico et al. '593 reference and in further view of the Gitlits reference

Regarding the rejection of claims 1-4, 8, 13-14, 20-21, 30-31 and 34-35, the Examiner

alleges that the D'Amico et al. '593 reference would have been combined with D'Amico et al. '100 reference and further that the Gitlits reference would have been combined with the combination of the D'Amico et al. '593 reference and the D'Amico et al. '100 reference to form the claimed invention. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different matters and problems.

Specifically, the D'Amico et al. '100 reference and the D'Amico et al. '593 reference are directed to the problem the substantial infrastructure investment and complexity that is required when each cell is required to measure and report signal strength to determine whether to hand off a call between cells (col. 1, lines 30-40 in the D'Amico et al. '100 reference and inherently in the D'Amico et al. '593 reference).

In stark contrast, the Gitlits reference is directed to the completely different and unrelated problem of a limited number of frequencies being available in a cluster of cells for performing frequency hopping (col. 2, lines 1-4).

One of ordinary skill in the art who was concerned with the problem of the substantial infrastructure investment and complexity that is required when each cell is required to measure and report signal strength to determine whether to hand off a call between cells as the two D'Amico et al. references are concerned with solving would not have referred to the Gitlits reference because the Gitlits reference is directed to the completely different and unrelated problem of a limited number of frequencies being available in a cluster of cells for performing frequency hopping.

Indeed, neither of the D'Amico et al. references teaches or suggests anything at all related to frequency hopping.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, the Examiner does not even support the combination by identifying a reason for combining the references.

The Examiner alleges that it would have been obvious to modify the system disclosed by the D'Amico et al. '100 reference to switch a time slot allocated to an on-board mobile station to continuously communicate across a plurality of radio zones as disclosed by the D'Amico et al. '593 reference "in order to reduce channel usage and save bandwidth by each base station."

However, contrary to the Examiner's allegation, the D'Amico et al. '593 reference does not provide any motivation at all for switching a time slot allocated to an on-board mobile station. Rather, the D'Amico et al. '593 reference only describes how such an already existing time slot allocation system can be improved by having the subscriber monitor the strength of received signals from various cells.

Therefore, while the D'Amico et al. '593 reference appears to disclose switching a time slot allocated to an on-board mobile station, the D'Amico et al. '593 reference does not provide any motivation for any system which might not use such a time slot allocation process to be modified to use a time slot allocation process.

Indeed, the Examiner fails to present a *prima facie* case of obviousness by citing a source for the alleged motivation.

"THE PRIOR ART MUST SUGGEST THE DESIRABILITY OF THE CLAIMED INVENTION

'There are three possible sources for a motivation to combine the

references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." (M.P.E.P. § 2143.01 emphasis original).

The Examiner does not cite any portion of the applied references which make any sort of connection at all between switching a time slot allocated to an on-board mobile station and reducing channel usage and saving bandwidth.

Even assuming arguendo that one of ordinary skill in the art would have been motivated to combine these references, the combination would not teach or suggest each and every element of the claimed invention.

Contrary to the Examiner's allegation, the D'Amico et al. '100 reference does not teach or suggest simultaneously providing each of the radio zones with a plurality of communication frequencies.

Rather, the D'Amico et al. '100 reference discloses that "adjacent cells operate on different frequencies to avoid interference" (col. 1, lines 17-19). In other words, each cell has its own unique frequency which is different than the adjacent cells.

More particularly, the D'Amico et al. '100 reference explains that as a roving station moves between cells that "it is necessary for a central controller to instruct the roving station as to which frequency it should move in order to access another cell." (Col. 1, lines 20-24). The D'Amico et al. '100 reference further explains that the communication system includes a plurality of cells having different "operating characteristics" (col. 1, lines 42-46) and that these "operating characteristics can include frequency of operation, bit rate, and/or communication slot information" (emphasis added, col. 1, line 67 - col. 2, line 2).

The D'Amico et al. '100 reference further explains that the roving station may include a memory means for storing "the frequency, bit rate and time slot assignment of adjacent

cells" (emphasis added, col. 2, lines 4-6).

The D'Amico et al. '100 reference further explains that while each cell has its own unique operating frequency that each cell is capable of communicating with multiple roving stations by using a TDMA system within that cell (col. 2, lines 55 - 68). In particular, the D'Amico et al. '100 reference explains that the data frame for each cell may be "further subdivided into slots which for example can correspond to communication to or from a particular radio within the cell." (col. 2, lines 65-68). Thus, the D'Amico et al. '100 reference provides the ability for each cell to communicate with multiple roving stations by using a TDMA system within each cell and prevents interference between cells by assigning each cell with a unique frequency.

With regard to avoiding interference, the D'Amico et al. '100 reference explains that two approaches may be used. "The first approach involves utilizing different frequencies for the individual cells (FDMA)." Applicant points out to the Examiner that this is the same language used at col. 1, lines 17-19 which is cited by the Examiner. However, the D'Amico et al. '100 reference further explains that as the number of cells increase that the number of remaining available frequencies dwindle and that the number of available frequencies may not be able to accommodate all of the cells (col. 3, lines 27-29). This problem exists because each cell is assigned a single frequency.

The D'Amico et al. '100 reference further explains the second approach of allowing "the same frequency" to be used by adjacent or remote cells provided that the cells do not utilize the same time slots (col. 3, lines 36-38). Thus, "the number of cells which could utilize the same frequency by utilizing different slots, is limited only by the required number of slots for individual cells." (emphasis added, col. 3, lines 40-43). Therefore, contrary to the Examiner's allegations, nowhere within the D'Amico et al. '100 reference is there any

teaching at all that each cell may be simultaneously provided with a plurality of communication frequencies.

Next, the Examiner alleges that the D'Amico et al. '100 reference "inherently" teaches "switching a communication frequency used in each of the radio zones in order for the adjacent cells to operate on different frequencies" and cites col. 3, lines 45-47. The Applicant does not contradict this assertion.

However, regarding independent claims 4, 13, 40, and 45-50, Applicant respectfully submits that the D'Amico et al. '100 reference does not teach or suggest switching between the plurality of communication frequencies within each of the radio zones using a time division scheme such that a different time slot is allocated for adjacent radio zones for each of the plurality of communication frequencies, where communication is made using a single frequency.

Rather, as pointed out by the Examiner, the D'Amico et al. '100 reference merely teaches that the operating characteristics (including the frequency) of each base station may be changed. However, the D'Amico et al. '100 reference does not teach or suggest making such a change in frequency using a time division scheme such that a different time slot is allocated for each of the plurality of communication frequencies in adjoining radio zones and such that communication is made using a single frequency as recited by independent claims 4, 13, 40, and 45-50.

Indeed, the Examiner contradicts the Examiner's allegation that the D'Amico et al. '100 reference discloses switching between the plurality of communication frequencies using a time division scheme. Specifically, at page 3, lines 16-18 of the October 24, 2003 Office Action the Examiner states "The combination of D'Amico (US 5,127,100) and D'Amico (US 5,159,593) do (sic) not specifically disclose switching between the plurality of

communication frequencies within each or the radio zones using a time division scheme."

Clearly, neither of the D'Amico et al. references teaches or suggests this feature.

The D'Amico et al. '100 reference explains that each radio zone has its own unique radio frequency, as explained above in relation to the FDMA system. These passages have absolutely nothing to do with switching of frequencies in the cells, let alone switching the frequencies in a time division scheme within each cell such that a different time slot is allocated for each adjacent radio zone and such that adjacent radio zones are capable of using the same one of the plurality of frequencies but in different time slots.

Similarly, the D'Amico et al. '593 reference only discloses a generic time division scheme without disclosing anything at all about changing frequencies. In summary, the D'Amico et al. '593 reference merely discloses the same generic TDMA system which is disclosed by the D'Amico et al. '100 reference.

In recognition of at least this deficiency of the D'Amico et al. references, the Examiner alleges that the Gitlits reference discloses switching between the plurality of communication frequencies within each of the radio zones using a time division scheme.

The Gitlits reference discloses a cellular telecommunications method that is designed to improve robustness against poor propagation condictions such as multipath fading. According to the Gitlits reference, each cell can use all frequencies allocated to a cluster in a time division scheme by swapping the allocated frequencies within each cell and swapping sets of frequencies between the cells. The swapping is performed by frequency hopping at low speed.

Although the present invention is similar to the method disclosed by the Gitlits reference in respect of switching a plurality of frequencies previously allocated to each radio zone, the present invention is completely different from the method disclosed by the Gitlits

reference.

A) Communications method

The method that is disclosed by the Gitlits reference frequently changes the frequency used by a mobile terminal while communicating with a cell to reduce the effects of multipath fading.

In stark contrast, according to the present invention, a frequency used by a mobile terminal in a radio zone is not changed in the same radio zone. The primary reason why each radio zone has a plurality of frequencies is that communication between each radio zone and a mobile terminal running through the plurality of radio zones is made using a single frequency.

B) Relationship between time slot and frequency hopping

In the method disclosed by the Gitlits reference, time slots and frequency hopping are merely synchronized so as to ensure each time slot. Since the frequency hopping is performed at low speeds, the frequency hopping is not performed for each period of a time slot but for every several periods in each channel. There is also no need of period synchronization.

In stark contrast, according to the present invention, in order to achieve communication between each radio zone and a mobile terminal running through the radio zones using a single frequency, the use frequency for each radio station (zone) is changed for each time slot. Remember the primary object of the present invention is to achieve the high speed handover by switching a plurality of frequencies previously allocated to each radio zone so as to make it possible for a mobile terminal to use only one frequency to communication across all of the plurality of radio zones.

Further, while the Gitlits reference does appear to disclose switching between a

plurality of communication frequencies within each of the radio zones, contrary to the Examiner's allegation, the Gitlits reference does not teach switching using a time division scheme.

Rather, the Gitlits reference describes two completely independent frequency switching processes which are used together in the system disclosed by the Gitlits reference.

First, the Gitlits reference explains a technique of frequency hopping where a particular signal is transmitted while being periodically switched (i.e. hopped) to a new frequency. In this manner, if any one of the frequencies which are hopped across are subject to a poor signal to error ratio, then the signal is only adversely affected while using that particular frequency. (Col. 1, lines 47 - 65). This frequency hopping is done in reference to a "particular signal" (col. 1, line 59) and is, therefore, done by each individual cell while communicating with a mobile terminal, In other words, the "particular signal" is hopped across multiple frequencies within each cell.

Second, the Gitlits reference explains that this frequency hopping technique is improved when additional frequencies are available (col. 1, line 65 - col. 2, line 1). However, the Gitlits reference also explains that there is only a limited number of frequencies available (col. 2, lines 1 - 4). To address this problem, the Gitlits reference introduces the concept of "swapping the different frequencies amongst the cells" (emphasis added, col. 2, lines 9-10). In other words, a set of frequencies are transferred from one cell to another cell.

In summary, the Gitlits reference discloses hopping frequencies within each cell and also swapping frequency sets between cells.

The Examiner cites col. 6, lines 34-50 of the Gitlits reference in an attempt to support the Examiner's allegation that the Gitlits reference discloses switching between the plurality of communication frequencies within each of the radio zones using a time division scheme.

However, contrary to the Examiner's allegation, the Gitlits reference merely discloses that frequency swapping (i.e. between cells) may be performed in a time division scheme. Thus, the Examiner's citation of the Gitlits reference does not support the Examiner's allegation.

Therefore, contrary to the Examiner's allegation, the Gitlits reference does not teach or suggest switching between the plurality of communication frequencies within each of the radio zones using a time division scheme.

Moreover, since the Gitlits reference encourages the use of frequency hopping, which encourages switching frequencies by the mobile terminal for any particular signal within a cell, the Gitlits reference actually teaches away from the claimed invention which recites continuously communicating with the on-board mobile terminal on the same frequency.

In order to frequency hop, each mobile terminal must switch frequencies along with the particular base station that is communicating with that mobile terminal. The Gitlits reference specifically explains that it is advantageous to perform frequency hopping because any one of the frequencies will only be able to adversely affect the particular signal being transmitted between the mobile terminal and the particular base station while that particular frequency is being used and will not adversely affect that particular signal when the particular signal has hopped over to a different frequency (col. 1, lines 53-65).

In stark contrast, the present invention is directed to reducing the burden that is placed on the mobile terminals by not requiring them to switch frequencies at all. Rather, the on-board mobile terminals in accordance with the present invention maintain continuous communication even while switching between a plurality of radio zones while only using a single frequency merely by switching time slots.

In summary, none of the applied references teach or suggest the combination of features of the present invention including: 1) switching between a plurality of

communication frequencies within each radio zone using a time division scheme; 2) such that a different time slot is allocated for each adjacent radio zone for each of the plurality of communication frequencies, let alone these features in combination with 3) adjacent radio zones using the same communication frequency but with different time slots; 4) switching the time slot allocated to the on-board mobile station to continuously communicate at one of the communication frequencies at one of the plurality of frequencies

Therefore, the Examiner is respectfully requested to withdraw this rejection of claims 1-4, 8, 13-14, 20-21, 30-31 and 34-35.

B. The D'Amico et al. '100 reference in view of the D'Amico et al. '593 reference in view of the Gitlits reference and in further view of the Janesch et al. reference

Regarding the rejection of claims 22-24, and 32-33, the Examiner alleges that the D'Amico et al. '593 reference would have been combined with D'Amico et al. '100 reference, that the Gitlits reference would have been combined with the combination of the D'Amico et al. '100 and D'Amico et al. '593 references and further that the Janesch et al. reference would have been combined with a combination of the D'Amico et al. '100, D'Amico et al. '593, and Gitlits references to form the claimed invention. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different matters and problems.

As explained above, one of ordinary skill in the art who was concerned with the

problem of the substantial infrastructure investment and complexity that is required when each cell is required to measure and report signal strength to determine whether to hand off a call between cells as the two D'Amico et al. references are concerned with solving would not have referred to the Gitlits reference because the Gitlits reference is directed to the completely different and unrelated problem of a limited number of frequencies being available in a cluster of cells for performing frequency hopping.

In contrast to the D'Amico et al. references and the Gitlits reference, the Janesch et al. reference is directed to the completely different and unrelated problem of reducing the acquisition time of a carrier-recovery loop (col. 2, lines 22-23).

One of ordinary skill in the art who was concerned with the problem of the substantial infrastructure investment and complexity that is required when each cell is required to measure and report signal strength to determine whether to hand off a call between cells as the two D'Amico et al. references are concerned with solving or who was concerned with limited number of frequencies being available in a cluster of cells for performing frequency hopping as the Gitlits reference is concerned with solving would not have referred to the Janesch et al. reference because the Janesch et al. reference is directed to the completely different and unrelated problem of reducing the acquisition time of a carrier-recovery loop.

Thus, the references would not have been combined, absent hindsight.

Even assuming arguendo that one of ordinary skill in the art would have been motivated to combine these references, the combination would not teach or suggest each and every element of the claimed invention.

The Janesch et al. reference, like the D'Amico et al. '100, D'Amico et al. '593, Gitlits references, does not teach or suggest the features of the present invention including: 1) switching between a plurality of communication frequencies within each radio zone using a

time division scheme; 2) such that a different time slot is allocated for each adjacent radio zone for each of the plurality of communication frequencies, let alone these features in combination with 3) adjacent radio zones using the same communication frequency but with different time slots; and 4) switching the time slot allocated to the on-board mobile station to continuously at one of the communication frequencies at one of the plurality of frequencies.

Thus, the Janesch et al. reference does not remedy the deficiencies of the D'Amico et al. '100, D'Amico et al. '593, Gitlits references.

Therefore, the Examiner is respectfully requested to withdraw this rejection of claims 22-24, and 32-33.

Further, regarding new independent claims 45-50, there is no teaching or suggestion of such limitations for all of the reasons described above.

Further, regarding new dependent claims 42-44, there is no teaching or suggestion of a time division scheme where each time slot for each radio zone uses a different one of a plurality of communication frequencies.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1-50, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 1/26/07

James E. Howard
Registration No. 39,715

McGinn & Gibb, PLLC
8321 Old Courthouse Rd., Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 21254